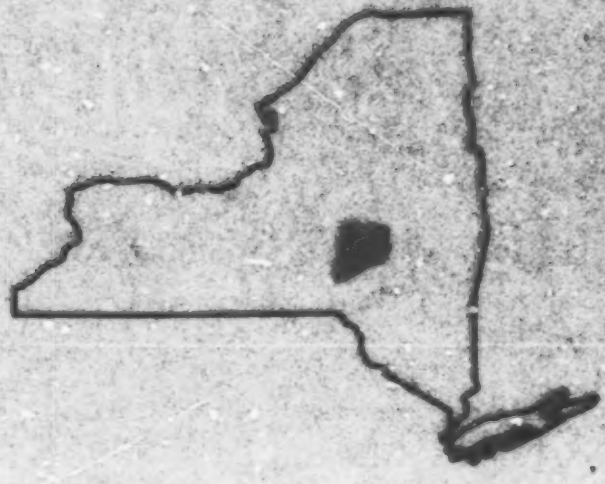
JUL 25 1988 85 594-C-32 FEM 1.209: 361281
COMPLETED 30

FLOOD INSURANCE STUDY

ORIGINAL

TOWN OF UNADILLA, NEW YORK
OTSEGO COUNTY



SEPTEMBER 30, 1987

Federal Emergency Management Agency

COMMUNITY NUMBER - 361281

BEST COPY AVAILABLE

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

BEST COPY AVAILABLE

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
	1.1 Purpose of Study	1
	1.2 Authority and Acknowledgments	1
	1.3 Coordination	1
2.0	AREA STUDIED	2
	2.1 Scope of Study	2
	2.2 Community Description	2
	2.3 Principal Flood Problems	4
	2.4 Flood Protection Measures	4
3.0	ENGINEERING METHODS	4
	3.1 Hydrologic Analyses	5
	3.2 Hydraulic Analyses	6
4.0	FLOODPLAIN MANAGEMENT APPLICATIONS	7
	4.1 Floodplain Boundaries	7
	4.2 Floodways	8
5.0	INSURANCE APPLICATION	12
6.0	FLOOD INSURANCE RATE MAP	13
7.0	OTHER STUDIES	14

BEST COPY AVAILABLE

TABLE OF CONTENTS - continued

	Page
8.0 LOCATION OF DATA	14
9.0 BIBLIOGRAPHY AND REFERENCES	14

FIGURES

Figure 1 - Vicinity Map	3
Figure 2 - Floodway Schematic	11

TABLES

Table 1 - Summary of Discharges	5 - 6
Table 2 - Floodway Data	9 - 10

EXHIBITS

Exhibit 1 - Flood Profiles	
Susquehanna River	Panels 01P-05P
Unadilla River	Panels 06P-09P
Exhibit 2 - Flood Insurance Rate Map Index and Street Index	
Flood Insurance Rate Map	
Exhibit 3 - Elevation Reference Marks	

BEST COPY AVAILABLE

FLOOD INSURANCE STUDY
TOWN OF UNADILLA, OTSEGO COUNTY, NEW YORK

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Unadilla, Otsego County, New York, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by Leonard Jackson Associates for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-83-C-1190. This work was completed in November 1985.

1.3 Coordination

In November 1979, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives from FEMA, the town, and Leonard Jackson Associates (the study contractor) to determine the streams to be studied by detailed methods. Information concerning the history of flooding in the community was provided by Town Officials and residents; the U. S. Geological Survey (USGS); and the U. S. Army Corps of Engineers (COE), Baltimore District.

On December 2, 1986, a final CCO meeting, attended by representatives from FEMA, the town, and the study contractor, was held to review the results of the study.

BEST COPY AVAILABLE

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Unadilla, Otsego County, New York. The area of study is shown on the Vicinity Map (Figure 1).

The Susquehanna River and the Unadilla River were studied by detailed methods for their entire lengths within the community. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction through November 1990.

Rogers Hollow Brook, Ideuma Brook, The Fly, and Sand Hill Creek were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the Town of Unadilla.

2.2 Community Description

The Town of Unadilla is located in the southwestern portion of Otsego County in southeast New York State. The town is bordered by the Town of Butternuts to the north; the Town of Otego to the east; the Town of Sidney, and the Villages of Sidney and Unadilla to the south; and the Towns of Bainbridge and Guilford to the west. The town occupies an area of approximately 47.5 square miles. According to the 1980 census, the population of the town was 4,027 (Reference 1).

The Susquehanna River flows along the southern edge of the Town of Unadilla and forms the border with Delaware County. The river flows in a southwestern direction through the town for a distance of approximately 10.3 miles with a gentle slope of 0.0010. The drainage area at the downstream corporate limits is approximately 1,588 square miles.

The Unadilla River flows along the western edge of the town and forms the border with Chenango County. The river flows in a southern direction through the town for a distance of approximately 8.0 miles with a gentle slope of 0.0008. At its confluence with the Susquehanna River, the drainage area is approximately 562 square miles.

The climate of the town is characterized by moderately warm summers and cold winters. The mean July temperature is approximately 67.5 degrees Fahrenheit (°F), while the mean January temperature is approximately 20.2°F. The mean annual precipitation over the area is approximately 39.0 inches. Precipitation in the form of snowfall and sleet occurs mainly in the months of December through March with an average annual snowfall of approximately 77.1 inches (Reference 2).

BEST COPY AVAILABLE

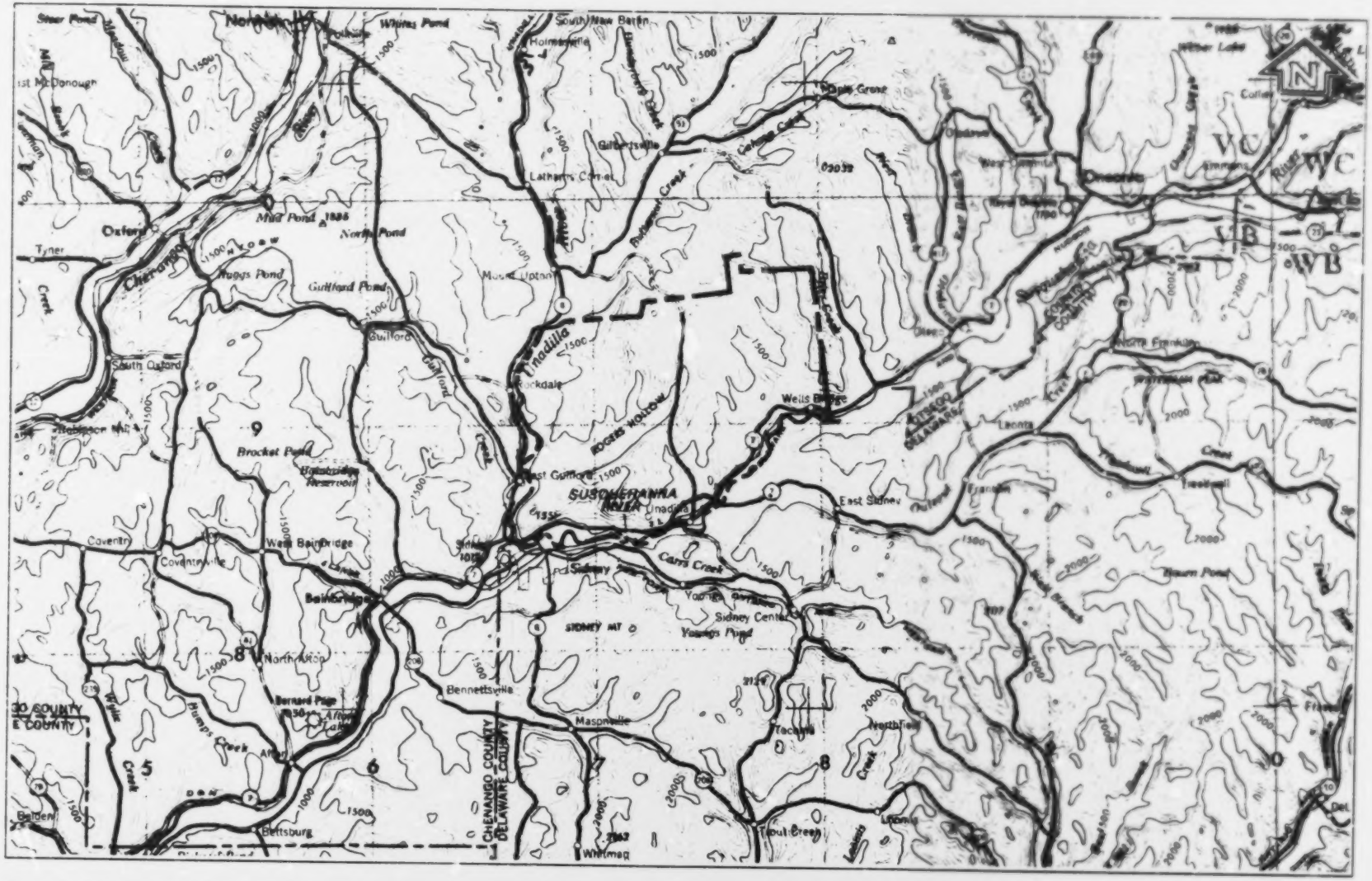


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF UNADILLA, NY
(OTSEGO CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

BEST COPY AVAILABLE

2.3 Principal Flood Problems

Floods can occur in the community during all seasons, but generally the most notable floods have occurred between the months of February and April when snowmelt adds to heavy spring rains to produce increased runoff. Summer and fall floods also occur due to hurricane activity (Reference 3).

The most recent major flood occurred on March 14, 1977, when USGS stream flow gage No. 01500500 on the Susquehanna River measured a peak flow of 23,500 cubic feet per second (cfs) within the Town of Unadilla. This event was estimated to be a 25 year event.

2.4 Flood Protection Measures

There are no structural flood protection measures located on either the Susquehanna River or the Unadilla River within the town.

Non-structural measures of flood protection are being utilized to aid in the prevention of future flood damage. These measures are in the form of land use regulations, which control building within areas that have a high risk of flooding.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

BEST COPY AVAILABLE

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

The hydrologic analysis of the Susquehanna River was computed from gage data. The USGS operates stream flow gage No. 01500500 located in the Village of Unadilla. The gage has 47 years of systematic records. A log-Pearson Type III flood frequency analysis was performed to determine peak 10-, 50-, 100-, and 500-year discharges on the Susquehanna River. The gage is centrally located, and the computed gaged peaks were transposed upstream and downstream using the ratio of the drainage areas raised to the 0.75 power.

The hydrologic analysis of the Unadilla River was also computed from gage data. The USGS operates stream flow gage No. 01502500 located at the hamlet of Rockdale, located within the community. The gage has 57 years of systematic records. A log-Pearson Type III flood frequency analysis was performed to determine peak 10-, 50-, 100-, and 500-year discharges on the Unadilla River. These peak discharges were then transposed upstream and downstream using the ratio of the drainage areas raised to the 0.75 power.

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
SUSQUEHANNA RIVER					
At downstream corporate limits	1,588	28,700	36,900	40,300	48,000
Just upstream of confluence with Unadilla River	1,025	20,700	26,600	29,000	34,500
At USGS gage No. 01500500, Unadilla, New York	982	20,029	25,726	28,075	33,456
Just upstream of confluence of Ouleout Creek	867	18,200	23,400	25,600	30,500
Just upstream of confluence of Sand Hill Creek	849	18,000	23,100	25,200	30,000

BEST COPY AVAILABLE

TABLE 1 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
UNADILLA RIVER					
At its confluence with Susquehanna River	562	14,700	19,100	20,900	25,000
Just upstream of confluence of Guilford Creek	538	14,200	18,500	20,200	24,200
At USGS gage No. 01502500, in Rockdale, New York	520	13,886	17,999	19,698	23,594

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross-section data for the backwater analysis for the streams studied in detail were obtained from aerial photographs (Reference 4). The below-water sections were obtained by field measurement. All bridges and culverts were field surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Water-surface elevations of floods of the selected recurrence intervals were computed using the COE HEC-2 step-backwater computer program (Reference 5). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations for the Susquehanna River were obtained from normal depth calculations utilizing the slope/area method. Starting water-surface elevations for the Unadilla River were obtained using normal depth calculations.

Channel and overbank roughness factors (Manning's "n") used in the hydraulic computations for the streams studied in detail were chosen by engineering judgment and based on field observations of the stream and floodplain areas. The channel "n" values for the Susquehanna River ranged from 0.030 to 0.045, and the overbank "n" values ranged from 0.050 to 0.150. The channel "n" values for the Unadilla River ranged from 0.030 to 0.045, and the overbank "n" values ranged from 0.050 to 0.150.

BEST COPY AVAILABLE

An "n" value of 0.015 was used for concrete structures and 0.024 was used for corrugated metal pipes. A weighted average "n" value was used for bridges with steel decks, concrete abutments, and earthen bottoms. Non-effective flow areas were accounted for by using high "n" values. The acceptability of all assumed hydraulic factors, cross sections, and hydraulic structure data was checked by calibrating computed flood profiles to known historic flood profiles.

Flood elevations for the streams studied by approximate methods were determined by normal depth calculations.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For the streams studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:4,800 with a contour interval of 4 feet (Reference 6).

For the streams studied by approximate methods, the 100-year flood boundary was delineated using topographic maps at a scale of 1:24,000 with a contour interval of 20 feet (Reference 7).

BEST COPY AVAILABLE

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary is shown on the Flood Insurance Rate Map (Exhibit 2).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as a minimum standard that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 2). The computed floodway is shown on the Flood Insurance Rate Map (Exhibit 2). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodway widths for the Susquehanna River and the Unadilla River extend beyond the corporate limits.

BEST COPY AVAILABLE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Susquehanna River								
A	600	1337/682	17,976	2.2	985.5	985.5	986.5	1.0
B	2,690	1001/126	12,943	2.2	986.1	986.1	987.1	1.0
C	5,350	473/358	6,243	4.6	986.6	986.6	987.6	1.0
D	7,880	198/108	3,909	7.4	988.9	988.9	989.9	1.0
E	11,100	2088/2033	20,684	1.4	991.2	991.2	992.1	0.9
F	14,580	2400/250	18,205	1.6	991.8	991.8	992.7	0.9
G	20,800	702/127	6,206	4.7	997.1	997.1	998.1	1.0
H	25,850	239/124	3,710	7.8	1,002.4	1,002.4	1,003.4	1.0
I	29,190	562/67	6,047	4.8	1,008.0	1,008.0	1,009.0	1.0
J	43,250	475/100	5,306	4.8	1,021.4	1,021.4	1,022.2	0.8
K	46,100	1007/700	8,769	2.9	1,024.5	1,024.5	1,025.5	1.0
L	49,620	614/94	5,490	4.7	1,027.7	1,027.7	1,028.5	0.8
M	54,190	304/120	5,122	5.0	1,033.3	1,033.3	1,034.2	0.9
N	57,040	519/430	5,088	5.0	1,035.5	1,035.5	1,036.5	1.0
O	61,740	238/140	3,422	7.4	1,041.7	1,041.7	1,042.6	0.9
P	65,100	253/123	4,955	5.1	1,048.0	1,048.0	1,048.8	0.8

[1]Feet above corporate limits
[2]Width/width within corporate limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF UNADILLA, NY
(OSTEGO CO.)

FLOODWAY DATA

SUSQUEHANNA RIVER

BEST COPY AVAILABLE

BEST COPY AVAILABLE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Unadilla River								
A	460	353/353	3,013	5.3	985.8	979.9[3]	980.7	0.8
B	2,260	606/56	5,918	3.5	985.8	981.2[3]	982.2	1.0
C	4,000	208/60	3,172	6.6	985.8	985.4[3]	985.9	0.5
D	5,970	462/395	4,081	5.1	987.1	987.1	987.9	0.8
E	8,740	653/90	3,258	6.2	989.4	989.4	990.2	0.8
F	10,240	285/160	3,741	5.4	992.1	992.1	993.1	1.0
G	12,000	196/106	2,086	7.5	993.7	993.7	994.6	0.9
H	14,440	250/100	3,284	6.2	996.6	996.6	997.5	0.9
I	16,590	340/95	4,119	4.9	998.2	998.2	999.1	0.9
J	18,000	504/114	5,266	3.8	999.0	999.0	999.9	0.9
K	21,080	456/400	4,330	4.7	1,000.8	1,000.8	1,001.8	1.0
L	23,110	1305/1225	12,362	1.6	1,002.3	1,002.3	1,003.2	0.9
M	25,100	624/540	4,378	4.6	1,002.7	1,002.7	1,003.7	1.0
N	27,070	573/75	4,762	4.2	1,004.4	1,004.4	1,005.4	1.0
O	29,120	189/104	2,378	8.3	1,005.6	1,005.6	1,006.5	0.9
P	30,600	541/61	3,995	4.9	1,008.9	1,008.9	1,009.5	0.6
Q	32,760	233/75	2,174	9.1	1,012.0	1,012.0	1,012.5	0.5
R	34,720	216/110	3,016	6.5	1,015.6	1,015.6	1,016.5	0.9
S	36,250	228/128	3,615	5.4	1,017.0	1,017.0	1,017.8	0.8
T	38,420	337/250	4,172	4.7	1,017.9	1,017.9	1,018.6	0.7
U	40,580	410/145	5,387	3.7	1,018.9	1,018.9	1,019.8	0.9
V	41,920	415/85	4,791	4.1	1,019.5	1,019.5	1,020.3	0.8

[1]Feet above confluence with Susquehanna River
[2]Width/width within corporate limits
[3]Elevation computed without consideration of backwater from Susquehanna River

TABLE 2

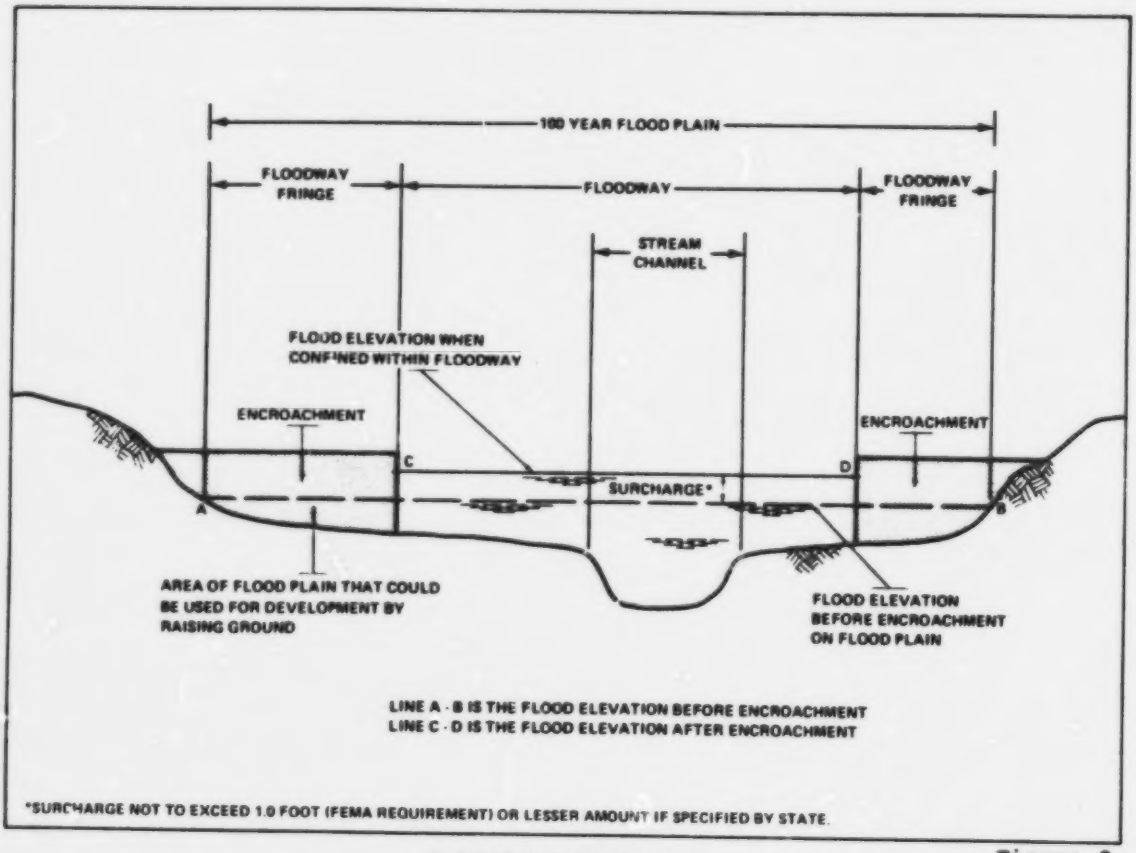
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF UNADILLA, NY
(OSTEGO CO.)

FLOODWAY DATA

UNADILLA RIVER

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC Figure 2

Near the mouths of streams studied in detail, floodway computations are made without regard to flood elevations on the receiving water body. Therefore, "Without Floodway" elevations presented in Table 2 for certain downstream cross sections of the Unadilla River are lower than the regulatory flood elevations in that area, which must take into account the 100-year flooding due to backwater from other sources.

BEST COPY AVAILABLE

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

BEST COPY AVAILABLE

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

BEST COPY AVAILABLE

7.0 OTHER STUDIES

Flood Insurance Studies for the Towns of Sidney and Otego, and the Villages of Sidney and Unadilla are currently being prepared (References 8, 9, 10, and 11). The results of those studies will be in exact agreement with the results of this study.

Due to more detailed information, this study supersedes the Flood Hazard Boundary Map for the Town of Unadilla (Reference 12).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 26 Federal Plaza, Room 1351, New York, New York 10278.

9.0 BIBLIOGRAPHY AND REFERENCES

1. U. S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, New York, Washington, D. C., U. S. Government Printing Office, 1981.

2. U. S. Department of Commerce, National Oceanic and Atmospheric Administration, Climatography of the United States No. 20, Asheville, North Carolina, National Climatic Center, December 1975.

3. U. S. Army Corps of Engineers, North Atlantic Division, "Water Resources Development in New York 1981," New York, New York, 1981.

4. Geomaps, Inc., of Mineola, New York, Aerial Photographs, Scale 1:9,600: Unandilla, New York, March 1984.

5. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, April 1980.

6. Geomaps, Inc., of Mineola, New York, Topographic Maps compiled from aerial photographs, Scale 1:4,800, Contour Interval 4 Feet: Unadilla, New York, April 1984.

7. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 10 Feet: Franklin, New York, 1943; Gilbertsville, New York, 1943; Guilford, New York, 1943; Otego, New York, 1943; Sidney, New York, 1943; Unadilla, New York, 1943.

BEST COPY AVAILABLE

8. Federal Emergency Management Agency, Flood Insurance Study, Town of Sidney, Delaware County, New York (Unpublished).

9. Federal Emergency Management Agency, Flood Insurance Study, Town of Otego, Otsego County, New York (Unpublished).

10. Federal Emergency Management Agency, Flood Insurance Study, Village of Sidney, Delaware County, New York (Unpublished).

11. Federal Emergency Management Agency, Flood Insurance Study, Village of Unadilla, Otsego County, New York (Unpublished).

12. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Unadilla, Delaware County, New York, July 30, 1976.

Chow, Ven Te, Open-Channel Hydraulics, New York, McGraw-Hill, 1959.

U. S. Department of Commerce, Weather Bureau, Technical Paper No. 40, Rainfall Frequency Atlas of the United States, Washington, D. C., 1961, Revised 1963.

U. S. Department of the Interior, Geological Survey, Techniques for Estimating Magnitude and Frequency of Floods on Rural Unregulated Streams in New York State Excluding Long Island by Thomas J. Zembrzuski & Bernard Dunn, Albany, New York, 1979.

BEST COPY AVAILABLE

EXHIBIT 3 - ELEVATION REFERENCE MARKS

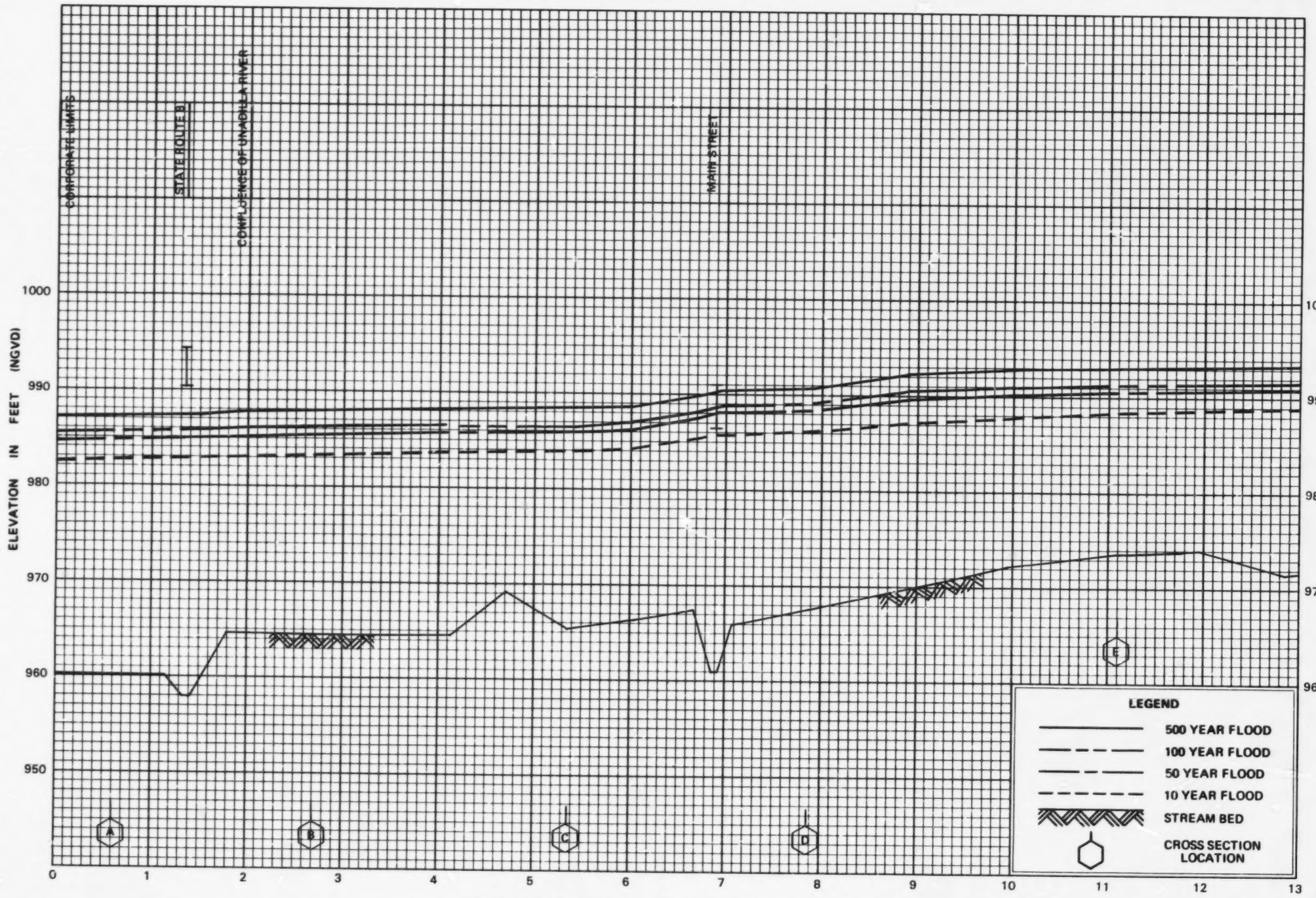
Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 1	08	1,017.19	Box cut on southeast stone wing wall of Batterson Road bridge over the Unadilla River.
RM 2	08	1,042.00	PK nail in top of wood guardrail post on east side of Spencer Road approximately 2,260 feet south of Batterson Road intersection.
RM 3	08	1,055.14	Box cut on southwest corner of concrete wing wall of bridge along Spencer Road .2 mile south of County Route 1 intersection.
RM 4	08	1,034.79	PK nail in top of wood guardrail post on west side of Spencer Road approximately .8 mile south of County Route 1 intersection.
RM 5	16	1,079.00	PK nail in top flange of corner post on west side of Spencer Road .2 mile post on west side of Spencer Road .2 mile north of County Route 2 intersection.
RM 6	16	1,008.41	Box cut on northwest corner of concrete abutment of bridge along Spencer Road approximately 300 feet south of County Route 1 intersection.
RM 7	18	993.75	Box cut on northeast corner of concrete bridge wall of Valley View Road bridge over the Unadilla River.

BEST COPY AVAILABLE

EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	FIRM Panel	Elevation (Feet NGVD)	Description of Location
RM 8	18	993.28	D cut on end of walkway at northeast corner of north side of State Route 7 bridge over the Unadilla River.
RM 9	18	993.32	X cut on guardrail post on north side of State Route 7 at centerline of Main Street intersection extended.
RM 10	18	1,001.47	Box cut on northwest corner wing wall of concrete bridge on State Route 7 approximately 50 feet west of Sheep Pen Road intersection.
RM 11	21	1,063.55	X cut on one of second set of bolts from west end of steel guardrail on south side of State Route 7 bridge over railroad.
RM 12	21	1,088.90	Box cut on northwest corner of wing wall of small tributary bridge on State Route 7 approximately .1 mile east of Old State Route 7 intersection.
RM 13	22	1,074.46	X cut on top of center steel guardrail post at northeast corner of State Route 7 and County Route 3..
RM 14	22	1,046.66	USGS disk stamped 1047 Albany 1898, in east corner of north abutment of Wells Bridge.

BEST COPY AVAILABLE



FLOOD PROFILES

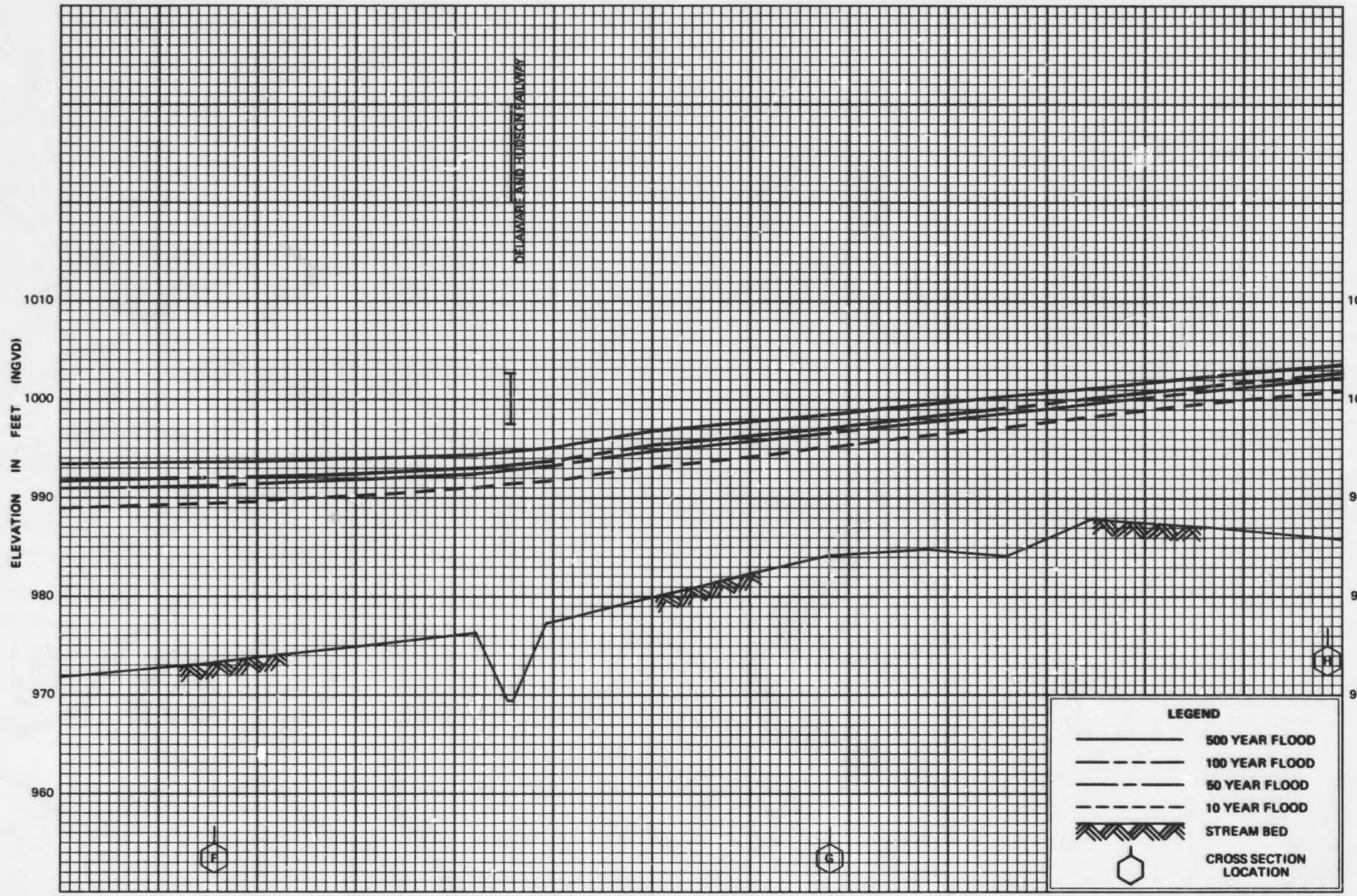
SUSQUEHANNA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF UNADILLA, NY
(OTSEGO CO.)

01P

BEST COPY AVAILABLE



FLOOD PROFILES

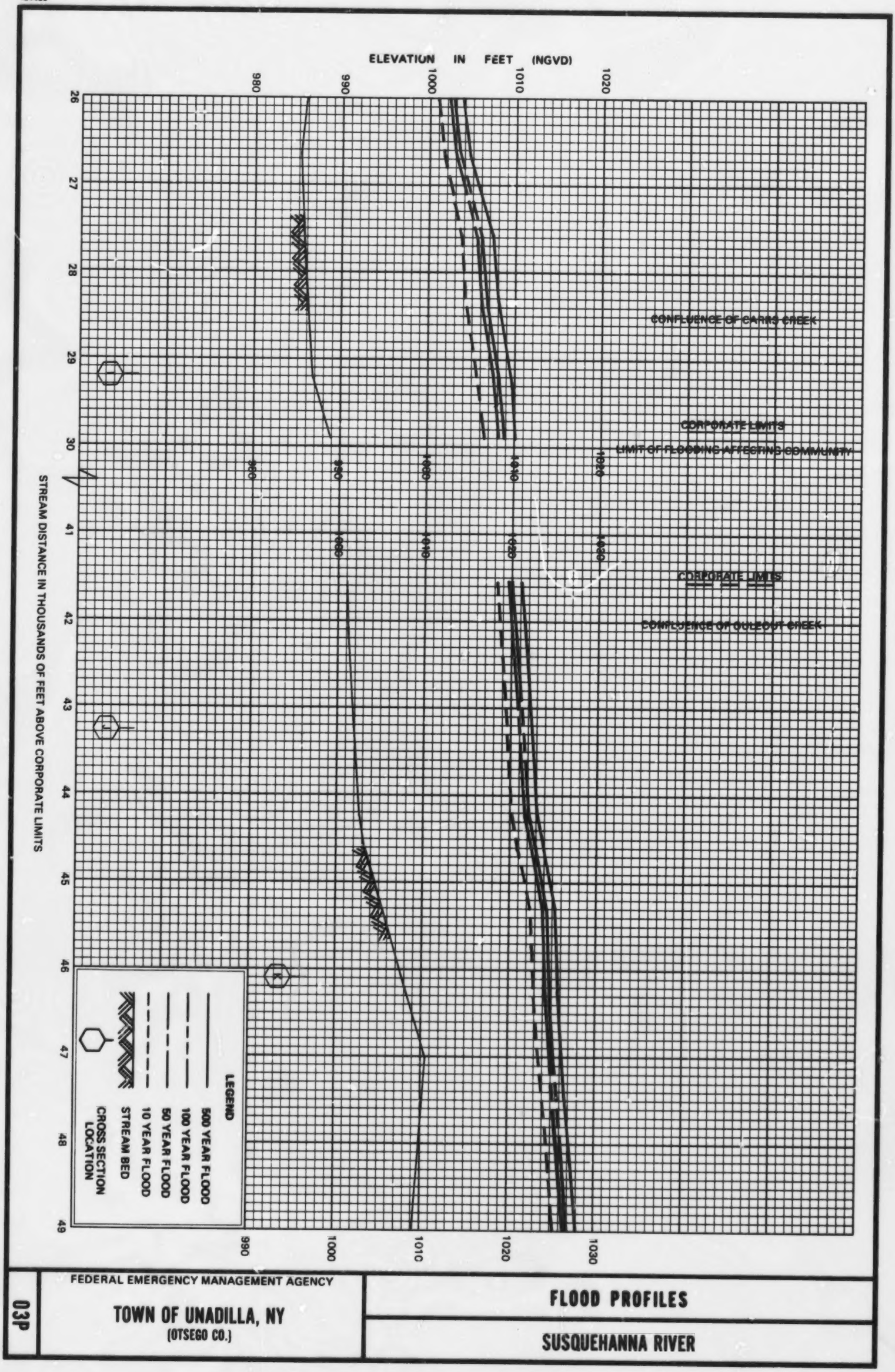
SUSQUEHANNA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF UNADILLA, NY
(OTSEGO CO.)

02P

BEST COPY AVAILABLE



FEDERAL EMERGENCY MANAGEMENT AGENCY

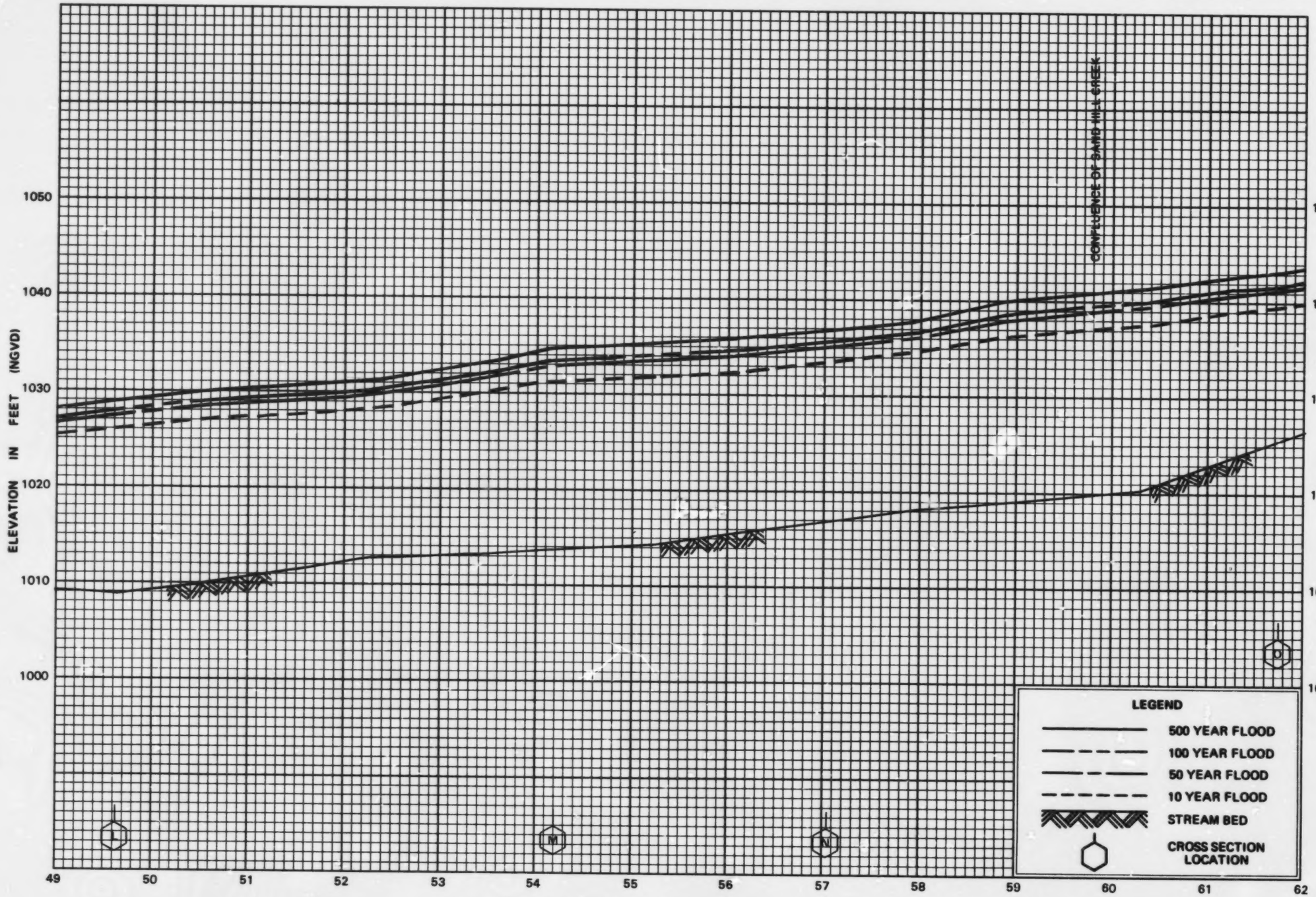
TOWN OF UNADILLA, NY
(OTSEGO CO.)

03P

FLOOD PROFILES

SUSQUEHANNA RIVER

BEST COPY AVAILABLE



FLOOD PROFILES

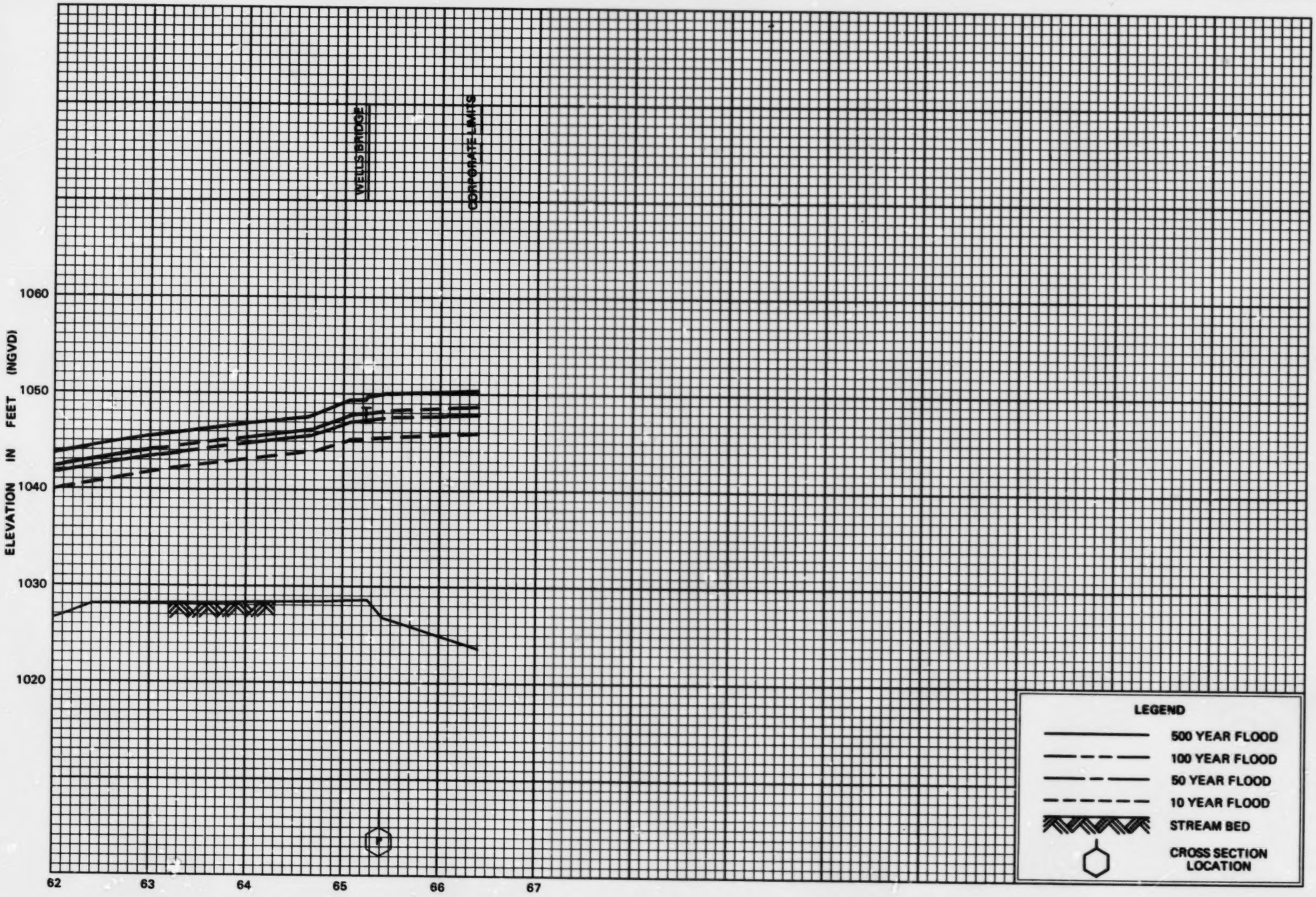
SUSQUEHANNA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF UNADILLA, NY
(OTSEGO CO.)

04P

BEST COPY AVAILABLE



FLOOD PROFILES

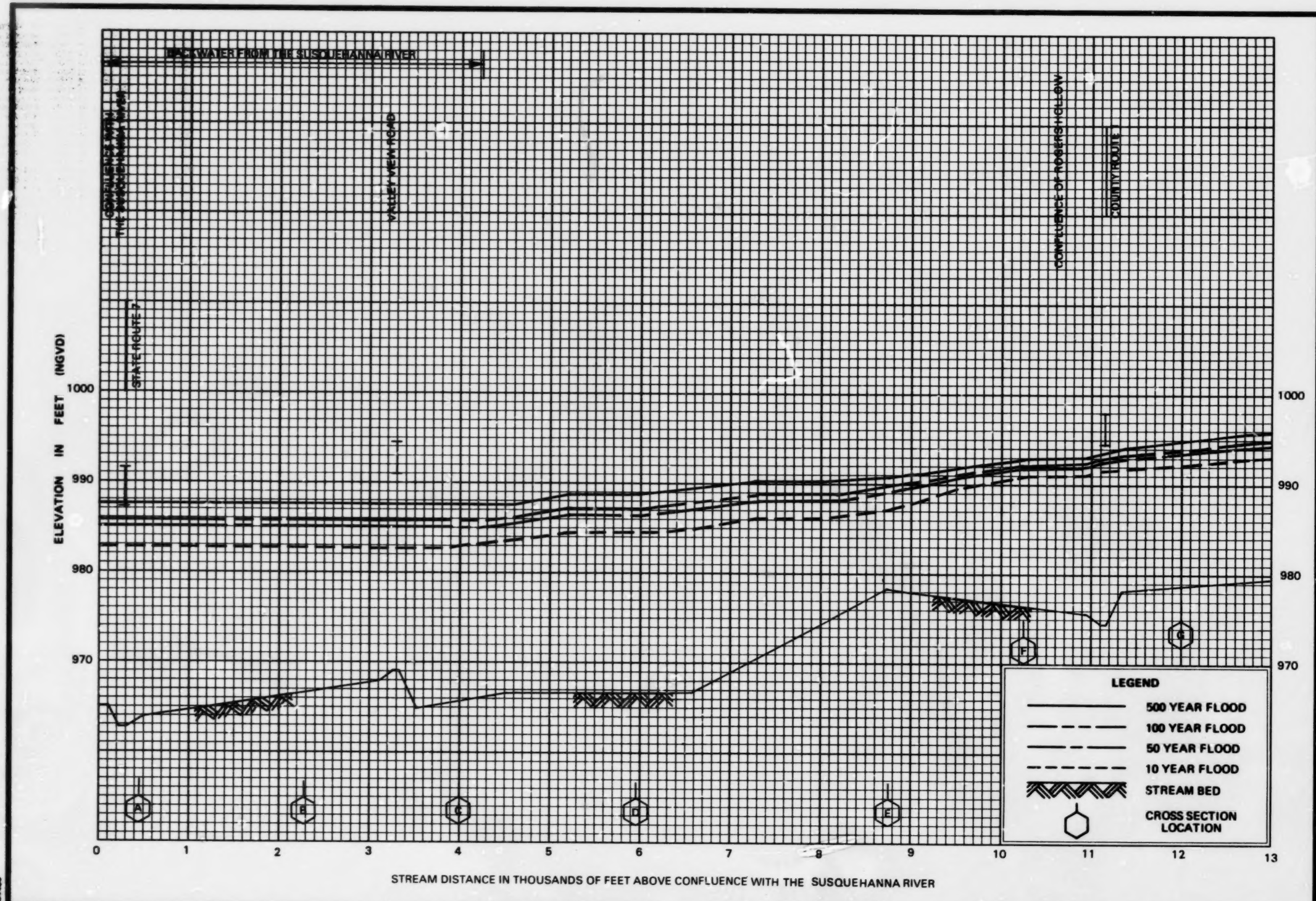
SUSQUEHANNA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF UNADILLA, NY
(OTSEGO CO.)

05P

BEST COPY AVAILABLE



FLOOD PROFILES

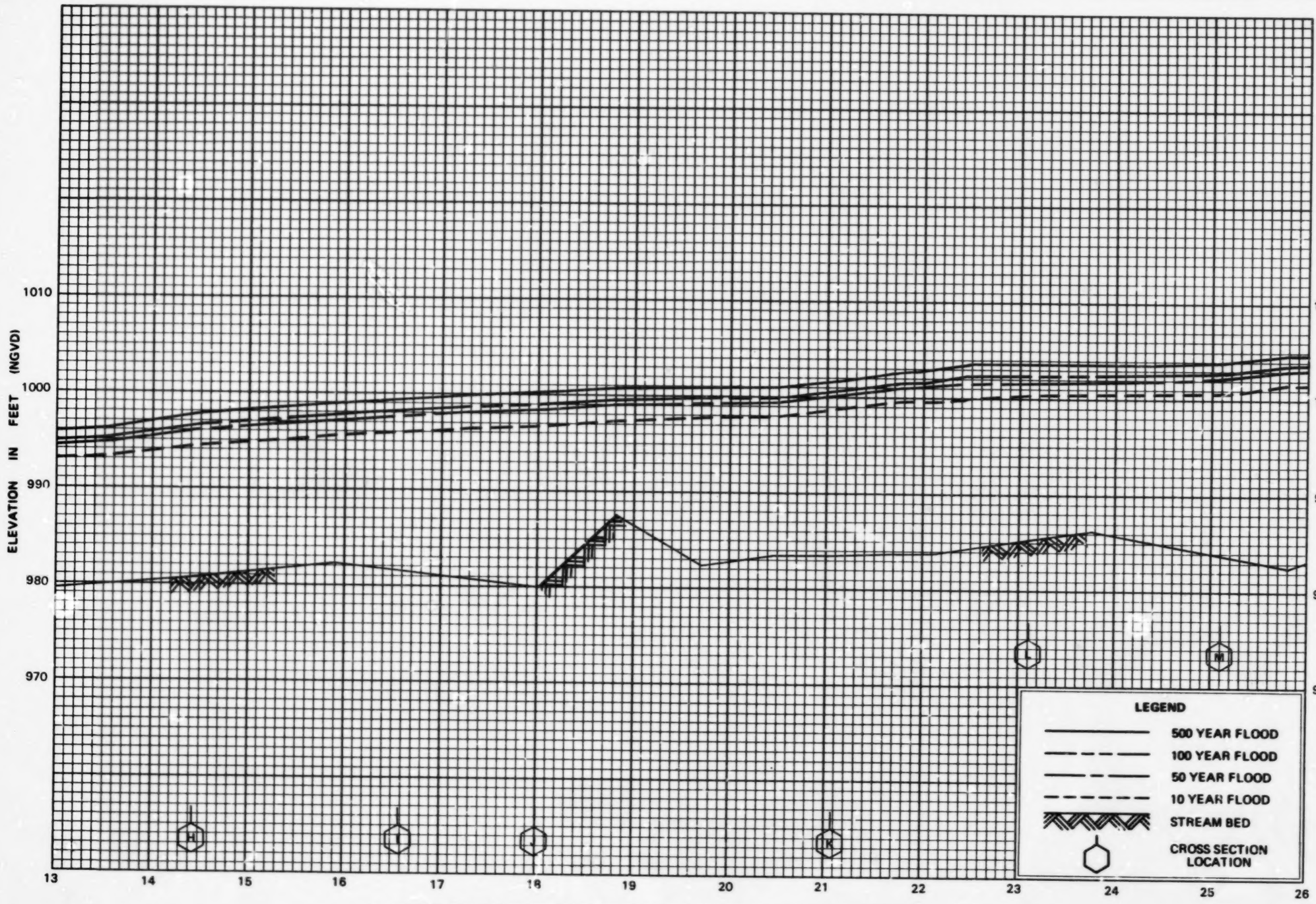
UNADILLA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF UNADILLA, NY
(OTSEGO CO.)

06P

BEST COPY AVAILABLE



FLOOD PROFILES

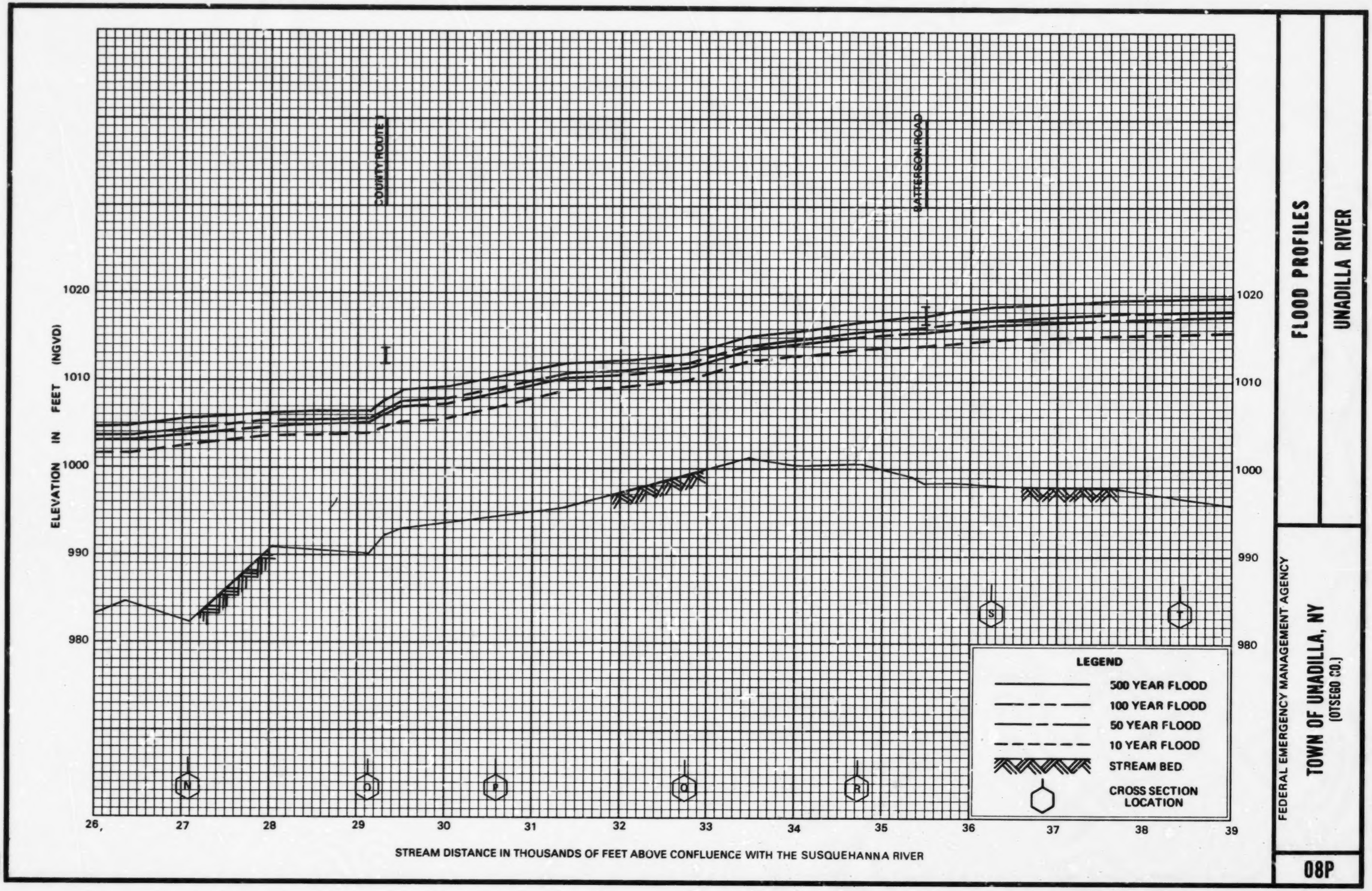
UNADILLA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF UNADILLA, NY
(OTSEGO CO.)

07P

BEST COPY AVAILABLE



FLOOD PROFILES

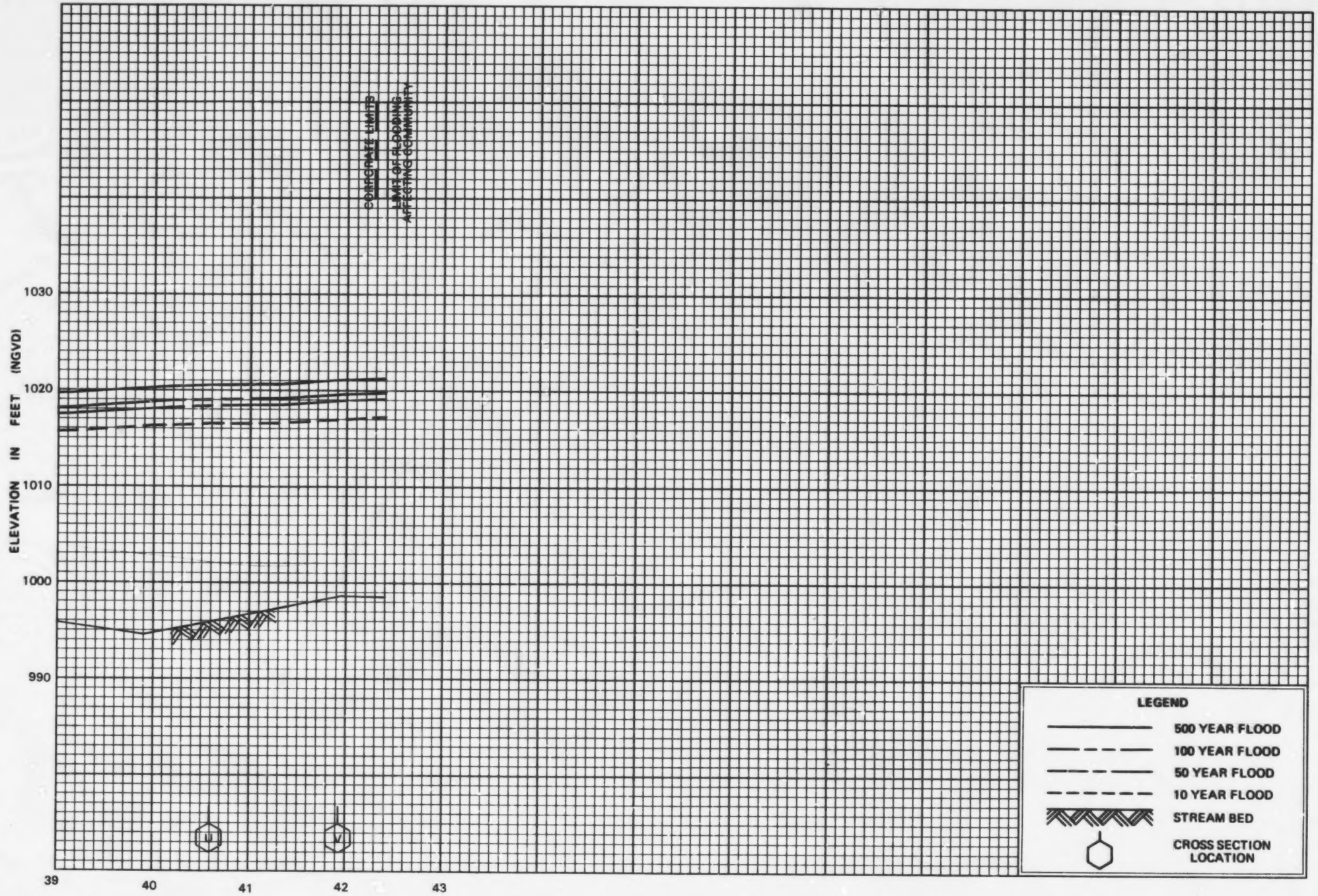
UNADILLA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF UNADILLA, NY
(OTSEGO CO.)

08P

BEST COPY AVAILABLE



FLOOD PROFILES

UNADILLA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF UNADILLA, NY
(OTSEGO CO.)

09P

BEST COPY AVAILABLE